agri-fax Alberta AGRICULTURE

88-05353/

Agdex 561-10

January, 1987

Irrigation Management of Potatoes

Potatoes are a commonly grown irrigated horticultural crop in Western Canada. They are a cool season crop requiring an optimum mean daily temperature of 15 to 20°C. A night-time temperature of below 15°C is required for tuber initiation and temperatures below 10°C or above 30°C sharply inhibit tuber growth.

Potatoes can be grouped into early season (90 to 105 days), mid-season (105 to 120 days) and late season varieties (120 to 150 days). The most important variety grown in Alberta is Russet Burbank, a late variety that requires a long growing season to reach maximum maturity and quality.

The majority of potatoes grown in southern Alberta are used in the french fry and potato chip industry, however many are also grown for table stock and seed.

Potatoes have a low tolerance to soil salinity in both the germination, seedling and more mature stages of growth. Yield decreases linearly as soil salinity levels increase.

Crop Water Requirements

Potatoes tend to grow best in soils that are moderately coarse textured (sandy loam, loam), but can be grown on fine textured soils as long as they are well [illegible]ed and carefully prepared.

Potatoes are a shallow rooted crop, developing an active root zone of approximately 80 cm (2.5 ft) in areas where there are no soil restrictions during the growth period.

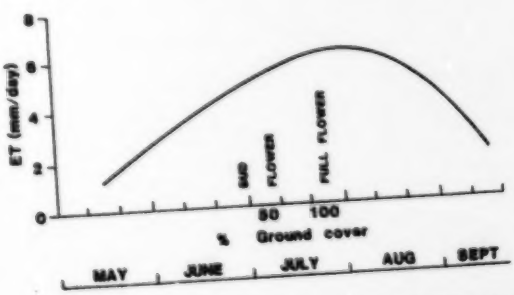

Figure 1. Crop water use of potatoes during the growing season

The growing season for potatoes extend from mid-May to mid-September. Crop water use will range from 500 to 600 mm (20 to 24 in.) of moisture per year. Over a 30-day period, maximum crop water may be as high as 6 mm/day (0.25 in.). During the seedling stage, water use will range from 2 to 4 mm/day (0.08 to 0.16 in./day). As the crop matures, crop water use may reach a high of 7 mm/day (0.28 in./day) and then fall to an average of between 3 to 4 mm/day (0.12 to 0.16 in./day) (See Figure 1).

Potatoes yield the highest and the plants make the most efficient use of water when soil moisture is kept near optimum levels (See Figure 2). Eighty per cent of the moisture requirements for potatoes comes from the

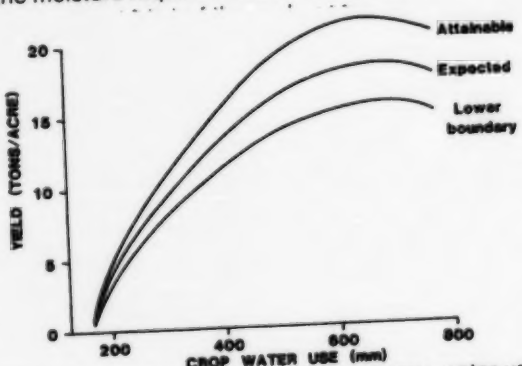

Figure 2. Relationship between potatoes water use and yield.

Potatoes tend to be more sensitive to moisture stress than most other field crops. Although optimum soil moisture conditions should be maintained throughout the growing season, the critical water requirement period for potatoes begins just prior to flowering through to tuber initiation and ends as the vines begin to ripen.

Comments

Potatoes that are grown for commerical purposes have a slightly higher allowable depletion level than fresh market potatoes (35 per cent for commercial potatoes versus 30 per cent for fresh market potatoes). This allows for an increase in the dry matter content and the potatoes are more suited to handling and storage.

Inadequate moisture levels result in small potato leaves and vines which can lead to seriously reduced yields. Water stress during the tubers formation period and abundant amounts of water later will increase hol-

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low heart in potatoes. Malformed tubers are caused by high fluctuating water levels or by water stress followed by a good supply of water. It is important to maintain sufficient and uniform soil moisture from tuber formation until maturity.

Irrigation Management Information:

For further information regarding irrigation management of potatoes, contact your nearest Irrigation Branch office. These offices are located at: Lethbridge, 381-5136; Vauxhall, 654-2161; Airdrie, 948-8511; Taber, 223-7908; Strathmore, 934-3356; Brooks, 362-1212; Bow Island, 545-2231; Medicine Hat, 529-3616. North of Calgary, contact the Airdrie office or your local district agriculturist for assistance.

Growth and root development of potatoes

GROWTH PERIODS	EMERGENCE	BUD	FLOWER	FULL GROWN	RIPENING
POST EMERGENCE DATES	15 - 25 DAYS	40 - 60 DAYS	85 - 115 DAYS		90 - 150
CROP * ROOTING DEPTH	1.5 cm/DAY		MINIMAL ROOT EXTENSION		
MOISTURE SENSITIVE PERIOD **					
AVERAGE E.T.	1.5 - 3.0mm/DAY	3.0 - 5.5mm/DAY	5.5 - 6.5mm/DAY		< 6.5mm/DAY

* Maximum rooting depth will occur approximately by the time flowering begins.

** For optimum production, the first irrigation will be required before the crop enters into its water sensitive period.

The above times, depth and amounts are only average values for this particular crop. These values will change depending on the variety and area where this crop is grown.

Soil

Soils can vary greatly in texture from being very fine (clay) to very coarse (sand) within a crop root zone. Because soil texture can change quite quickly, so can the amount of water that the soil is able to hold.

Texture	Available Moisture
Loamy sand	8-12 mm/0.1m (0.9-1.4 in./ft)
Sand loam	10-15 mm/0.1m (1.2-1.8 in./ft)
Loam	14-18 mm/0.1m (1.7-2.1 in./ft)
Sand clay loam, clay loam, clay	15-20 mm/0.1m (1.8-2.4 in./ft)
Silty clay loam, silt loam	16-22 mm/0.1m (1.9-2.6 in./ft)

It is important to know and to be able to calculate the amount of moisture present in the soil root zone in order to understand the amount of moisture available for crop use. The allowable depletion level is the amount of soil moisture that can safely be removed from the root zone by a crop before an irrigation is required. For potatoes, the allowable depletion level has been determined to be 35 per cent. The simplest way to determine soil moisture content is by the "feel" method. By feeling, squeezing and observing a handful of soil, one can determine the amount of moisture present in the soil. The following chart outlines the various characteristics of soil based on different contents of water.

		Feel or Appearance of Soils		
	PERCENT OF AVAILABLE MOISTURE REMAINING	MODERATELY COARSE TEXTURE	MEDIUM TEXTURE	MODERATELY FINE TEXTURE
DO NOT IRRIGATE	At field capacity 100	Upon squeezing no free water appears on soil but wet outline of ball is on left hand.	Same as sandy loam.	Same as sandy loam.
	75 to field capacity	Forms a weak ball, breaks easily, will not slide.	Forms a ball and is very pliable; slicks readily if relatively high in clay.	Easily ribbons out between fingers, has a slick feeling.
IRRIGATE SPEC. CROPS	50 to 75	Tends to ball under pressure but seldom will hold together	Forms a ball; somewhat plastic; will sometimes slick slightly with pressure.	Forms a ball, will ribbon out between thumb and forefinger
IRRIGATE	25 to 50	Still appears to be dry, will not form ball with pressure.*	Somewhat crumbly but will hold together from pressure	Somewhat pliable, will ball under pressure
	0 to 25	Dry, loose, single-grained, flows through fingers.	Powdery, dry, sometimes slightly crusted but easily breaks down into powdery condition.	Hard, baked, cracked; sometimes has loose crumbs on surface.

* Ball is formed by squeezing a handful of soil firmly.